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Bibliography of Bog Lemmings

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Adelman, E. B. 1979. A survey of the nongame mammals in the Upper Rattlesnake Creek drainage of western Montana. [M.S. Thesis] University of Montana, Missoula. 129 pp.

- Small mammal diversity, niche width and niche overlap were studied in the Upper Rattlesnake Creek drainage, Montana. Snap-trap results, habitat associations and observations are described. For SYNAPTOMYS: habitat was a wet sedge-bluejoint meadow (subalpine fir/bluejoint-bluejoint habitat type); one male caught 9/8/78 in 200 trap-nights; measurements; associated species included: SOREX VAGRANS, CLETHRIONOMYS GAPPERI, and MICROTUS PENNSYLVANICUS.

Allen, J. A. 1903. Mammals collected in Alaska and northern British Columbia by the Andrew J. Stone expedition of 1902. Bull. Amer. Mus. Nat. Hist. 19:521- 567.

- For SYNAPTOMYS BOREALIS: Describes the Type specimen of SYNAPTOMYS CHAPMANI, sp. nov. (=S. BOREALIS) by an adult male specimen taken in July 1901 in Glacier, B.C. Gives external and skull measurements and pelage description.

Allen, J. A. 1904. Mammals collected in Alaska by the Andrew J. Stone expedition of 1903. Bull. Amer. Mus. Nat. Hist. 20:273-292.

- Gives lists of all locations trapped and species at each (arranged in species accounts). 66 SYNAPTOMYS BOREALIS were taken at 5 locations trapped. 1/3 were adults, 4 females and 15 males. Measurements were taken and separated by sex. At Seldovia SYNAPTOMYS was found "most frequently in little marshy meadows, but was also sometimes taken in timber in places like those inhabited by red- backed mice."

Anderson, R. M. 1932. Five new mammals from British Columbia. Natl. Mus. Can. Bull. 70:99-119.

- Describes 5 new species of mammals from Canada including Type of SYNAPTOMYS BOREALIS ARTEMISIAE from Stevenson Creek, SW of Princeton at 2400 ft elevation . Known only from Similkameen valley from 2400-5600 ft. Description of color, size, skull. Five individuals (4 males, 1 female) were taken at 2400 ft site, 4 (2 males, 2 females) at a 5600 ft site. The habitat at the lower site is dry Transition zone, with sagebrush, pine grass, and occasional PINUS PONDEROSA. The upper site is Engelmann spruce, subalpine fir, and abundant ground cover including VALERIANA SITCHENSIS, VERATRUM VIRIDE, ANEMONE OCCIDENTALIS, VACCINIUM, LUPINUS, and waist-high dense SALIX. Compares external and skull measurements of subspecies ARTEMISIAE (6Male, 3Female), CHAPMANI (10M, 3F), WRANGELI (2M, 2F), BOREALIS (2M), and DALLI (3?).

Anderson, R. M. 1947. Catalogue of Canadian Recent mammals. Natl. Mus. Can. Bull. 102. 238 pp.

- For SYNAPTOMYS BOREALIS: Taxonomic review of specimens by location. Gives 9 subspecies all in single species.

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Anderson, R. M., and A. L. Rand. 1943. A new lemming mouse (SYNAPTOMYS) from Manitoba with notes on some other forms. Can. Field-Nat. 57:101-103.

- Distribution, measurements, descriptions, and taxonomy.

Anderson, S. 1962. A new northern record of SYNAPTOMYS BOREALIS in Ungava. J. Mammal. 43:421-422.

- Record of SYNAPTOMYS for the Ungava peninsula is a new northern record for the species. Bones of 2 lemmings were found in an owl pellet.

Baker, R. H. 1951. Mammals taken along the Alaska Highway. Univ. Kansas Publ ., Mus. Nat. Hist. 5(9):87-117.

- Gives lists of all locations trapped and species at each (arranged in species accounts). SYNAPTOMYS BOREALIS taken at 2 of 43 locations trapped. At one 30X60 ft grassy area near McIntyre Creek, Yukon, 2250 ft elevation 5 were taken in 66 trap-nights. In thick sedge bordering a small pond at Deadman Lake , Alaska, 1800 ft., one was taken.

Banfield, A. W. F. 1974. The mammals of Canada. University of Toronto Press, Toronto. Reprinted, 1981.

- Detailed accounts of 196 species. Includes information on description, habits , habitat, reproduction, ecological status, and distribution. 46 color plates , 100 black and white drawings. SYNAPTOMYS BOREALIS: distribution; description ; short underground burrows and runways through vegetation; constructs globular nests of grass above ground in winter and below ground in summer; active all winter and throughout 24 hr day; food includes grasses and sedges which are cut into short sections and piled in runways; habitat primarily sphagnum-labrador tea-black spruce bogs but also found in deep mossy spruce woods, wet subalpine meadows, alpine, and sagebrush (one subspp) habitat; breeding season from May-Aug; litters average 4, range 2-8; uncommon in NW Can and rare in E Canada; nine poorly differentiated subspp.

Banfield, F. A. 1941. Notes on Saskatchewan mammals. Can. Field-Nat. 55:117- 123?.

- Short accounts of new records. SYNAPTOMYS BOREALIS was collected (adult male) from the edge of a grassy flat bordering a small marshy bay of Emma Lake.

Bangs, O. 1897. On a small collection of mammals from Hamilton Inlet, Labrador . Proc. Biol. Soc. Wash. 11:235-240.

- SYNAPTOMYS BOREALIS collected at Fort Chimo, Labrador; description of single male collected.

Bangs, O. 1898. A list of the mammals of Labrador. Amer. Nat. 32:489-507.

- An early list of Labrador mammals. Lists Type specimen of SYNAPTOMYS INNUITUS (=BOREALIS) from Fort Chimo, Labrador.

Bangs, O. 1900. Three new rodents from southern Labrador. Proc. New England Zool. Club 2:35-41.

- Describes Type specimen of SYNAPTOMYS INNUITUS MEDIOXIMUS (=BOREALIS) from Lance au Loup, Labrador. Adult male with description and measurements.

Beasley, L. E. and L. L. Getz. 1986. Comparison of demography of sympatric populations of MICROTUS OCHROGASTER and SYNAPTOMYS COOPERI. Acta Theriologica 31:385-400.

- Both species followed multi-year cycles. Population changes and survival were similar, with lemmings showing less dramatic changes during the cycle.

Beckstrom, S. G. 1993. Food habits of boreal owl during brood-rearing in southwest Montana. Unpubl. ms. 15 pp.

- Pellets from 10 nest boxes found CLETHRIONOMYS GAPPERI the most important food item (53.6%). PHENACOMYS INTERMEDIUS was next most important with 20.7% biomass. Small mammals in general were 99% of prey biomass. 8 SYNAPTOMYS BOREALIS were found in 4 nests, comprising 0.7% of the diet.

Booth, E. S. 1947. Systematic review of the land mammals of Washington. Ph.D. Thesis, Wash. State Univ., Pullman.

- Good review of knowledge up to that time; has some locations missed by Dalquest (1947). Has information (by subspecies) for all Washington land mammals and includes: dot maps, systematics, taxonomy, descriptions, and habitat. For SYNAPTOMYS BOREALIS: shows 2 locations in the North Cascade Mountains. Only subspecies then known was WRANGELLI but Booth speculated others would be found farther east (he was right). Description and measurements. Habitat is described as wet, boggy places in the mountains.

Bursik, R. J. 1993. Fen vegetation and rare plant population monitoring in Cow Creek Meadows and Smith Creek Research Natural Area, Selkirk Mountains, Idaho. Cooperative Challenge Cost-share Project, Idaho Panhandle National Forests and Idaho Conservation Data Center, Idaho Department of Fish and Game . 25 pp.

- Botanical exploration has revealed that Cow Creek Meadows, on the east slope of the Selkirk Mountains, Idaho, are of extraordinary biodiversity value. Seven rare plant populations are known from the meadows along with one rare animal (Northern Bog Lemming). In addition, grizzly bear and woodland caribou are known to use the drainage during parts of the year. Human activities in the form of cattle grazing, logging, and road building have had an impact on the meadows and are seen as a potential threat to the sensitive plant and animal populations that occur there. In 1992, the Idaho Fish and Game's Conservation Data Center and the Bonners Ferry Ranger District, Idaho Panhandle National Forests, entered into a cooperative agreement to establish monitoring plots in fen habitats of Cow Creek Meadows and Smith Creek RNA to ascertain whether logging and cattle grazing are having negative effects on the sensitive plant populations in Cow Creek Meadows. Smith Creek RNA is the control area for this study. Nine ECODATA plots were placed in the Cow Creek Meadows and four were placed in Smith Creek RNA. An inventory of the vascular and bryophyte floras were made in each area. One hundred and one vascular and bryophyte species occur in the Cow Creek Meadows, making it one of the most floristically diverse peatland systems in Idaho. Reanalysis of Cover Microplot data for each ECODATA plot is recommended at three- to four-year intervals over the next 20 years or more to assess population and habitat trends. Management recommendations are made, including a proposal to establish Cow Creek Meadows as a Special Interest Botanical Area.

Clark, B. K. and D. W. Kaufman. 1990. Short-term responses of small mammals to experimental fire in tallgrass prairie. Can. J. Zool. 68:2450-2454.

- Short-term response to burning was moving off area by most harvest mice, southern bog lemmings, and prairie voles; deer mice moved onto burned area.

Clough, G. C., and J. J. Albright. 1987. Occurrence of the northern bog lemming, SYNAPTOMYS BOREALIS, in the northeastern United States. Can. Field- Naturalist 101:611-613.

- Three specimens of SYNAPTOMYS BOREALIS for Maine and one for New Hampshire are reported. On 18-20 July 1 immature female and 1 adult female (4 embryos) were captured in pitfalls (117 sherman live trap-nights, 108 pitfall trap- nights). Both were captured at 1375 m in a wet sedge meadow dominated by CAREX , sphagnum moss, lichen (CETRARIA NIVALIS), SALIX UVA-URSI, and BETULA GLANDULOSA. Associated species at the site were MICROTUS PENNSYLVANICUS, CLETHRIONOMYS GAPPERI, PEROMYSCUS MANICULATUS, BLARINA BREVICAUDA, and SOREX CINEREUS. A single immature male SYNAPTOMYS BOREALIS was captured on 11 Aug in a stand of dead fir and spruce at 400 m elevation. Understory was dominated by fir, spruce, mountain ash, and paper birch; shrub and ground layer was dense raspberry, ferns, some grass and sedge, and sphagnum in scattered damp areas. The area was trapped in 1982 (360 trap-nights), July 1985 (135 Longworth live trap-nights) and Aug 1985 (300 snap trap-nights). Other mammals at this site included MICROTUS CHROTORRHINUS, M. PENNSYLVANICUS , CLETHRIONOMYS GAPPERI, PEROMYSCUS MANICULATUS, and SOREX CINEREUS. There are now a total of 7 specimens from 4 locations in Maine and New Hampshire.

Coffin, B. and L. Pfannmuller (eds). 1988. Minnesota's endangered flora and fauna. U. Minn. Press, Minneapolis.

- Good reference for Minnesota sensitive species with state maps with county of occurrence, status and basis for status, habitat, identification, recommendations, and selected references. SYNAPTOMYS BOREALIS summarizes the 5 locations in N MN where lemmings are known. Suggests the species may be difficult to trap. Habitat given as dominated by sphagnum and graminoids; may include forested bogs or open ericaceous shrublands over total range. Recommend additional sampling by qualified professionals and preservation of large tracts of peatlands.

Cowan, I. M., and C. J. Guiguet. 1965. The mammals of British Columbia. Brit. Columbia Prov. Mus. Handbook 11. 414 pp.

- For SYNAPTOMYS BOREALIS: description and measurements; Habitat: usually wet alpine and subalpine meadows; runways and burrows well defined; moves to higher ground in winter; eats sedges, grasses, saxifrages, and other plants; makes small piles of cuttings in runways; deposits droppings in special places where 2 cupfuls may accumulate; 2-8 young per litter, usually 4-5; young born May-Aug; winter nest of dry grass 8" diameter; no citations for any of this information.

Cowan, I. McT. 1939. The vertebrate fauna of the Peace River District of British Columbia. Occasional Papers B.C. Prov. Mus. 1.

- For SYNAPTOMYS BOREALIS: On 28 June found a colony in muskeg and 4 were taken .

Habitat was 50 feet square and the "mossy carpet was honeycombed with tunnels." Fecal pellets were strewn about the tunnels, concentrated where feeding was occurring. 1-1.5 inch cuttings of grass were piled throughout the colony. Also caught here were MICROTUS PENNSYLVANICUS. Measurements.

Cross, E. C. 1938. SYNAPTOMYS BOREALIS from Godbout, Quebec. J. Mammal. 19:378.

- Single immature taken, with description and measurements.

Dalquest, W. W. 1948. Mammals of Washington. University of Kansas Mus. Nat. Hist. Publ. 2:1-444.

- Distributional accounts which include brief descriptions and accounts of habits; dot and associated shading on maps; key to spp. SYNAPTOMYS BOREALIS shows known 2 locations and a possible location (later verified by Wilson, Johnson and Reichel 1980).

Dearden, L. C. 1958. The baculum in LAGURUS and related Microtines. J. Mammal . 39:541-553.

- Describes variation in the baculi of LAGURUS. Compares baculi across Microtine genera including LEMMUS, SYNAPTOMYS, DICROSTONYX, CLETHRIONOMYS, PHENACOMYS, and MICROTUS (drawings). SYNAPTOMYS is shown to be most closely related to DICROSTONYX.

Dice, L. R. 1921. Notes on the mammals of interior Alaska. J. Mammal. 2:20-28.

- Records of unusual specimens taken in Alaska. Two SYNAPTOMYS BOREALIS taken, one in scrub willows and one in horsetails.

Downing, S. C. 1940. First Ontario record of the subgenus MICTOMYS. Can. Field -Nat. 54:109-110.

- One immature male 25 July 1939 at Moosonee, Ontario. Taken on an open bank of a small creek draining a bog. Surrounding area had spruce trees and deep mossy ground cover. Measurements and description.

Dutcher, B. H. 1903. Mammals of Mt. Katahdin, Maine. Proc. Biol. Soc. Wash. 16 :63-72.

- Describes 36 mammals known from Mt. Katahdin. For SYNAPTOMYS BOREALIS, 2 were trapped in balsam scrub by a spring at 4500 ft. during >270 trap-nights.

Edwards, R. L. 1963. Observations on the small mammals of the southeastern shore of Hudson Bay. Can. Field-Nat. 77:1-12.

- Caught 25 individuals at 5 sites (185 trap-nights); most were caught in open, very wet places. No scat piles or cuttings were associated with this species. Only 2 showed breeding activity, a male with scrotal testes on 23 Aug and a female with 3 embryos on 10 Sept. Most mice appeared to be yearlings. There appeared to be two litters per year, with some young breeding the same summer they were born. Description & measurements.

Foresman, K. R. and D. E. Pearson. 1990. Ecology of the northern bog lemming [abstract]. Sci.

Glacier Natl. Park 1990, Ann. Rep. Coop. Park Studies. p. 41.

- Relocated lemmings at Shoofly Meadows site [Adelman 1979] and found lemmings in Numa Ridge Bog in 1990.

Gaines, M. S., C. L. Baker and A. M. Vivas. 1979. Demographic attributes of dispersing southern bog lemmings (SYNAPTOMYS COOPERI) in eastern Kansas. Oecologica (Berlin) 40:91-101.

- There was a positive correlation between lemming colonizing removal grids and density of control grids. 41% of losses of control grids were accounted for by dispersal. Residents differed from dispersers by: 1) higher % males; 2) lower % of adult females colonizing grids were in breeding condition; reversed for subadult females; and 3) higher % subadults.

Gaines, M. S., R. K. Rose and L. R. McClenaghan, Jr. 1977. The demography of SYNAPTOMYS COOPERI populations in eastern Kansas. Can. J. Zool. 55:1584-1594.

- Annual and multi-year population cycles were found. Adult and juvenile survival was higher in winter than summer. Breeding was higher in summer than winter, but occurred during both periods.

Garton, E. R. 1977. Late Pleistocene and Recent mammals remains from two caves at Bowden, West Virginia [abstract]. Proc. W. Virginia Academy Sci. 49: 41.

- Found SYNAPTOMYS BOREALIS in a limestone cave; no time correlation could be done since they were in a cave-stream deposit.

Godin, A. J. 1977. Wild mammals of New England. Johns Hopkins University Press , Baltimore. 304 pp.

- Popular account of the mammals of New England. Covers description, distribution, ecology, behavior, age and sex determination, list of specimens examined, records and reports for each species. Literature references and museum sources cited.

Godin, A. J. 1977. Wild mammals of New England. Johns Hopkins University Press , Baltimore. 304 pp.

- Popular account of the mammals of New England. Covers description, distribution, ecology, behavior, age and sex determination, list of specimens examined, records and reports for each species. Literature references and museum sources cited. SYNAPTOMYS BOREALIS "occurs in cold sphagnum bogs, in bluebunch fields matted with weeds, and in dense hemlock and beech woods" [does not match other literature for the area, ie. Clough and Albright 1987]. Lemmings may build runways above ground or burrow in leaf litter. Nest is lined with leaves, grasses, and sometimes fur, and located either above or below ground. May be in small colonies or burrows of other small mammals. Known to eat raspberry seeds and the fungus ENDOGONE.

Green, M. M. 1930. Notes on some small Canadian mammals. Can. Field-Nat. 44:69.

- Two SYNAPTOMYS BOREALIS were taken near Pine Falls in Apr 1929. They were in an open tamarack bog with SOREX HOYI and SOREX CINEREUS. In May 1929 a male was taken 50 miles north of Pas and had side glands 11X7 mm. A female taken 8 May had 3 embryos 30 mm

long.

Groves, C. R. 1994. Effects of timber harvest on small mammals and amphibians in old-growth coniferous forests on the Priest Lake Ranger District, Idaho Panhandle National Forests. [Unpublished report to the Priest Lake Ranger District]. 18 pp. The Nature Conservancy, Boulder, Colorado.

- Abstract: Summary of field data collected in survey of small mammals and amphibians in old-growth coniferous forests on the Priest Lake Ranger District , Idaho Panhandle National Forests. Abundance and species richness were estimated on pitfall trapping grids with drift fences at 15 sites representing five replicates of three treatments. 5 shrew species, 1 pocket gopher sp., 6 sp. of mice and vole (including Northern Bog Lemmings) , and 3 amphibian sp. were found over a three year period.

Groves, C. and E. Yensen. 1989. Rediscovery of the northern bog lemming (SYNAPTOMYS BOREALIS) in Idaho. Northw. Nat. 70:14-15.

- A single adult male was captured on 14 July 1988 at Cow Creek, Boundary Co., Idaho at 1304 m elevation. The site was at the edge of a sphagnum bog next to an Englemann spruce tree. Dominant vegetation in the bog included: DESCHAMPSIA CAESPITOSA, CAREX ROSTRATA, ERIOPHORUM CHAMISSONIS, BETULA GLANDULOSA, KALMIA MICROPHYLLA, and SPHAGNUM spp. Other small mammals captured at the site included: ZAPUS PRINCEPS, CLETHRIONOMYS GAPPERI, SOREX spp, TAMIAS RUFICAUDUS, and MICROTUS PENNSYLVANICUS. The lemming was taken during 2 nights of trapping with 32 museum special snap traps and 16 pitfalls . The other Idaho SYNAPTOMYS site on Gold Peak Road (Johnson and Cheney 1953) was re-sampled in 1987 but no SYNAPTOMYS taken; it was logged sometime between the original capture and the re-trapping attempt in 1987. States that records of SYNAPTOMYS BOREALIS captured by Larrison (Larrison 1967; Larrison and Johnson 1981) were actually misidentified PHENACOMYS INTERMEDIUS.

Guthrie, R. D. 1968. Paleoecology of a Late Pleistocene small mammal community from interior Alaska. Arctic 21:223-244.

- SYNAPTOMYS BOREALIS is currently present at the site but was not found in Late Pleistocene deposits. Guthrie is unsure if it is a post-glacial immigrant or was present but not found.

Hall, E. R. 1981. Mammals of North America. 2nd edition. 2 vol. John Wiley and Sons.

- Identification and distribution information for mammals of North America. SYNAPTOMYS BOREALIS: description and measurements; distribution; 9 subspp.

Hall, E. R. and E. L. Cockrum. 1953. A synopsis of the North American Microtine rodents. Univ. Kansas Publ., Mus. Nat. Hist. 5:373-498.

- Good for synonymies, distribution, subspecies, key, and citations of original descriptions. For SYNAPTOMYS BOREALIS: places in subgenus MICTOMYS and lists 9 subspecies and their distributions. Gives external measurements as total:118 -135; tail:19-27; hind foot:16-22; ear:12-13; weight 32-34 g (n=2). Pelage description.

Hall, F. S. 1932. A historical resume of exploration and survey - mammal types and their

collectors in the state of Washington. Murrelet 13:63-91.

- Gives original citation and information from it on the description of SYNAPTOMYS TRUEI (=S. BOREALIS) from the Skagit Valley of Washington in 1859.

Hamilton, W. J., Jr. and J. O. Whitaker, Jr. 1979. Mammals of the eastern United States. Cornell University Press. Ithaca, NY. 346 pp.

- Listed by order. Useful information concerning distribution, habits. Provides range maps and illustrations. For SYNAPTOMYS BOREALIS: distribution and description only.

Harper, F. 1961. Land and fresh-water mammals of the Ungava Peninsula. Univ. Kansas Publ., Mus. Nat. Hist. 27: includes pp. 55-62.

- For SYNAPTOMYS BOREALIS: measurements and description. On 16 June an adult female was trapped on a mossy log in swamp among tall and low willows, dwarf birch, CAREX?, sphagnum, and liverwort. She had 7 embryos (13mm), enlarged mammary glands (2 pair pectoral, 2 pair inguinal, with drawing), and lateral glands slightly developed (10x4.5mm). On 17 July a male was trapped on a rock in a brook flowing through mossy woods. Surrounding vegetation included white spruce, tamarack, alder, willow (tall and low), Labrador tea, VIBURNUM EDULE, CORNUS CANADENSIS, RUBUS, COPTIS GROENLANDICA, VIOLA, TRIENTALIS BOREALIS, USNEA, and SPHAGNUM. He had moss (HYLOCOMIUM PYRENACIACUM) in his mouth. Testes were 8X5mm; lateral glands greatly developed 14X8 and 2mm thick; a less developed glandular area was located between each ear and foreleg. Another male found dead on 13 June had testes 7.5X6mm and lateral glands greatly developed 15X7mm. On the lemmings were found a flea (MEGABOTHRIS ASIO ASIO) and 3 species of mites (HEMOGAMASUS ALASKENSIS, LAELAPS ALASKENSIS, HAEMOLAELAPS GLASGOWI).

Heaney, L. R. and E. C. Birney. 1975. Comments on the distribution and natural history of some mammals in Minnesota. Can. Field-Nat. 89:29-34.

- Observations on the distribution and natural history of 18 species. SYNAPTOMYS BOREALIS found 10 mi S of Big Falls, an extension of the range in the central U.S. approximately 50 miles to the south of previous records (Wetzel and Gunderson 1949).

Heller, E. 1910. Mammals of the 1908 Alexander Alaska expedition. Univ. Calif . Publ. Zool. 5:321-360.

- For SYNAPTOMYS BOREALIS: collected 8 specimens. 3 are from Cordova in "a tangle of rye-grass, stumps, and salmonberry bushes." Five are from Port Nell Juan in open tundra in very swampy situations near the beach.

Hinton, M. A. C. 1926. Monograph of the voles & lemmings (Microtinae). Vol. 1 . British Mus. Nat. Hist., London.

- Taxonomic discussion of the subfamily. Places SYNAPTOMYS in the group Lemmi and says it is the most primitive of the true lemmings (SYNAPTOMYS, LEMMUS, MYOPUS). Divides the genus in two subgenera (SYNAPTOMYS, MICTOMYS) of which MICTOMYS is the most primitive. Long descriptions of skeletal and dental (rootless cheek teeth) differences with excellent drawings of cheek teeth. Says S. BOREALIS has 8 mammae and S. COOPERI 6. Gives

8 species and 9 forms but says many of doubtful validity.

Hoffmann, R. S., P. L. Wright and F. E. Newby. 1969. Distribution of some mammals in Montana. I. Mammals other than bats. J. Mammal. 50(3): 579-604.

- Distribution and specimen records listed for select mammals in Montana. SOREX PREBLEI, SCIURUS NIGER, PEROGNATHUS PARVUS, and PROCYON LOTOR are reported for the first time in Montana. Not extensive data. Two SYNAPTOMYS BOREALIS taken at same site in Glacier NP as Wright (1950) on 20-21 July 1953 but not taken in other of 17 years trapped since 1949. Gives dates, 15 Sep 1953 and 12 Sept 1956 for 2 additional specimens taken at Anaconda Creek, Glacier N.P. (see Weckwerth and Hawley 1962).

Hollister, N. 1912. Mammals of the Alpine Club expedition to the Mount Robson region. Canadian Alpine Journal, Spec. No. pp. 1-44.

- SYNAPTOMYS BOREALIS CHAPMANI recorded from Moose Pass, British Columbia, and Moose Pass Branch of the Smoky River, Alberta (in Howell 1927).

Hooper, E. T. and B. S. Hart. 1962. A synopsis of Recent North American Microtine rodents. Misc. Publ. Mus. Zool., Univ. Michigan 120. 68 pp.

- Systematic study primarily using glans characteristic and comparing cranial and external characteristics. Includes measurements and description of glans for a wide range of rodents including SYNAPTOMYS BOREALIS. The 2 SYNAPTOMYS species are shown to be closely related and the most closely related to them may be PHENACOMYS INTERMEDIUS.

Howell, A. B. 1927. Revision of the American lemming mice (genus SYNAPTOMYS). N. Amer. Fauna 50. 37 pp.

- A taxonomic revision of the genus SYNAPTOMYS. Gives distribution maps, drawings of dental and cranial characteristics, descriptions of the different subspecies (7), Type localities and citations, and lists of specimens. Ecological information is primarily based on SYNAPTOMYS COOPERI.

Ingles, L. G. 1965. Mammals of the Pacific States. Stanford University Press, Stanford, California. 506 pp.

- Very brief description, habitat, shaded map, and key to mammals in WA, OR, and CA.

Johnson, M. L. and P. W. Cheney. 1953. SYNAPTOMYS in Idaho and northeastern Washington. Murrelet 34:10.

- SYNAPTOMYS BOREALIS was collected at one site each in WA and ID. Two immature specimens (1 male, 1 female) were collected at Sema Meadows, Washington, 3000 ft, "at the edge of open beaver meadows" on 4-5 Aug 1952. Two adults (1 male, 1 female) were collected on Gold Peak Road, Idaho, 4200 ft, in a small bog along a stream on 8 Aug 1952.

Jones, J. K., Jr. and E. C. Birney. 1988. Handbook of mammals of the north- central states. U. Minn. Press, Minneapolis. 346 pp.

- Semi-popular account of mammals of the North-Central U.S. with general distribution maps (shading only), description with measurements, some natural history, and selected references. SYNAPTOMYS BOREALIS habitat is primarily bogs and marshy areas, but occasionally occurs in more xeric areas including dry woods and sagebrush. It digs short burrows and uses conspicuous runways. Globular nests of dry vegetation are built above ground in winter and below in summer. They do not hibernate. Food is grasses and sedges. Fecal pellets are bright green. The middle claws are enlarged during winter, presumably an adaptation to living in snow. Breeding season form May-Aug. Females produce several litters per year. Number of young range from 2-8, averaging 4. Females have 4 pair mammae (2 pectoral, 2 inguinal). Presumably northern bog lemmings have 3 maturational pelages and 2 seasonal molts in adults as do other microtines.

Jonkel, C. J. 1959. An ecological and physiological study of pine marten. M.S . Thesis, Montana State Univ., Missoula. 81 pp.

- Concluding phase of a long-term (1952-1958) study in Glacier NP. Investigated minimum breeding age, time of implantation, and ensuing time to parturition and continued studies on the relationship between small mammals and marten population densities. 2 individual SYNAPTOMYS BOREALIS trapped at two grids during 2 years.

Koenigswald, W. V., and L. D. Martin. 1984. Revision of the fossil Lemminae (Rodentia, Mammalia). Spec. Publ. Carnegie Mus. Nat. Hist. 9:122-137.

- Fossil history of the Lemminae is revised and three genera recognized: LEMMUS , SYNAPTOMYS, and MICTOMYS. DICROSTONYX and LAGURUS are excluded. Speculates Lemminae originated in Eurasia and SYNAPTOMYS immigrated to North America in the late Pliocene. Uses enamel patterns for comparison. Places SYNAPTOMYS BOREALIS in the genus MICTOMYS.

Krebs, C. J. and I. Wingate. 1985. Population fluctuations in the small mammals of the Kluane Region, Yukon Territory. Can. Field-Nat. 99:51-61.

- Looks at population changes in small mammals in the Yukon. Caught 7 SYNAPTOMYS BOREALIS in 110,628 snap-trap nights.

Larrison, E. J. 1970. Washington mammals, their habits, identification, and distribution. Seattle Audubon Soc., Seattle, Wash.

- Gives brief and anecdotal information about life history, identification, and distribution of Washington mammals. Lists locations for SYNAPTOMYS BOREALIS in Washington including E. Fork Gold Creek [specimens from that site have been re-identified as PHENACOMYS. Use of life history information for bog lemmings from this book is problematical since Larrison had misidentified material from both WA and ID (J.D. Reichel, pers. comm.).]

Larrison, E. J. and D. R. Johnson. 1981. Mammals of Idaho. Univ. Press of Idaho, Moscow. 166 pp.

- Gives brief and anecdotal information about life history, identification, and distribution of Idaho mammals. Lists locations for SYNAPTOMYS BOREALIS in Idaho; Larrison states that some specimens lack grooves in the upper incisors [these and perhaps others have been re-identified as PHENACOMYS. Use of life history information for bog lemmings from this book is

problematical since Larrison had misidentified material from both WA and ID (J.D. Reichel, pers. comm.).]

Layser, E. F. and T. E. Burke. 1973. The northern bog lemming and its unique habitat in northeastern Washington. Murrelet 54:7-8.

- SYNAPTOMYS BOREALIS is described from Bunchgrass Meadows in NE Washington at 5000 ft. Area is a true bog/fen of over a square mile with a few small spruce and fir islands. Plants present included: BETULA GLANDULOSA, CAREX LIMOSA, C. SCOPULORUM, DROSERA ANGLICA, LYCOPIUM SITCHENSE, KALMIA POLIFOLIA, SCHEUCHZERLA PALUSTRIS, SIBBALDIA PROCUMBENS, and SPHAGNUM. Authors list bird and herp spp also present. Present on the site were piles of grass and sedge cuttings at the base of small shrubs and along runways; most common cuttings were CAREX SCOPULORUM. A single bog lemming was captured during 140 snaptrap nights on 10-11 July 1972. Suggest threats to population may include: overgrazing, compaction of snow (destroying runways and nests) by snowmobiles , and impoundments which could flood the area.

Linzey, A. V. 1983. SYNAPTOMYS COOPERI. Mammalian Species 210:1-5.

- Good summary of available information.

Linzey, A. V. 1984. Patterns of coexistence in SYNAPTOMYS COOPERI and MICROTUS PENNSYLVANICUS. Ecol. 65:382-393.

- SYNAPTOMYS are excluded from preferred habitats by MICROTUS. The following patterns were observed: 1) In undisturbed sympatric populations, microhabitat partitioning was observed when habitat was marginal for voles. 2) Lemming microhabitat had more trees and shrubs when voles were present. 3) If vole populations declined, lemmings shifted into habitat previously occupied by voles. 4) Removal of voles from a grid resulted in immediate colonization by lemmings. 5) A year following lemming removal, former lemming habitat remained empty despite an increasing vole population. 6) Food of lemmings was less digestible than voles on grids where both occurred. 7) When voles were removed from a grid, lemming diets became more similar to voles (72 vs 37%).

Lyon, M. W., Jr. and W. H. Osgood. 1909. Catalogue of the Type specimens of mammals in the United States National Museum, including the Biological Survey Collection. U. S. Natl. Mus. Bull 62. 325 pp.

- Lists the Type specimens with citations of original description, what is present in collection and the state of the material.

Manville, R. H. and S. P. Young. 1965. Distribution of Alaskan mammals. Bur. Sport Fish Wildl. Circular 211. 74 pp.

- Provides dot range map for SYNAPTOMYS BOREALIS. Describes habitat as wet tundras and sphagnum bogs, occasionally dry or moist meadows.

Martell, A. M. 1974. A northern range extension for the northern bog lemming, SYNAPTOMYS BOREALIS BOREALIS (Richardson). Can. Field-Nat. 88:348.

- Near Inuvik, 4 specimens (3 M, 1 F) captured in 75,000 trap-nights.

Mead, J. I., C. J. Bell, and L. K. Murray. 1992. MICTOMYS BOREALIS (northern bog lemming) and the Wisconsin paleoecology of the east-central Great Basin. Quaternary Res. 37:229-238.

- Summarizes the paleo records of northern bog lemmings with a dot map and citations. Indications are that the species in the Snake Range on the NV/UT border was only locally present in or near mesic spruce forest habitat 24,000 to 15,000 yrs BP.

Millar, J. S., D. G. L. Innes, and V. A. Loewen. 1985. Habitat use by non- hibernating small mammals of the Kananaskis Valley, Alberta. Can. Field- Naturalist 99:196-204.

- Caught one northern bog lemming in "mature subalpine forest" during 26,700 trapnights.

Merriam, C. H. 1896. Revision of the lemmings of the genus SYNAPTOMYS, with descriptions of new species. Proc. Biol. Soc. Wash. 10:55-64.

- Descriptions and some locations. First to break SYNAPTOMYS into two subgenera.

Miller, G. S., Jr. 1896. Genera and subgenera of voles and lemmings. N. Amer. Fauna 12. 84 pp.

- Gives description of both species of SYNAPTOMYS, including pelage, measurements, skull, and teeth.

Morlan, R. E. 1989. Paleoecological implications of Late Pleistocene and Holocene microtine rodents from the Bluefish Caves, northern Yukon Territory. Can. J. Earth Sci. 26:149-156.

- A single SYNAPTOMYS BOREALIS found (in Holocene birch phase sediment) among 10s of thousands of small mammal remains. It was not found in Pleistocene deposits. Currently inhabits the area.

Munro, J. A. 1947. Observations of birds and mammals in central British Columbia. Occasional Papers B.C. Prov. Mus. 6.

- For SYNAPTOMYS BOREALIS: 2 locations in central BC; female w/ 4 embryos taken 15 May; all trapped in runways through VACCINIUM; associated species included MICROTUS PENNSYLVANICUS and CLETHRIONOMYS GAPPERI.

Osgood, W. H. 1900. A biological reconnaissance of the Yukon River Region: annotated account of mammals. N. Amer. Fauna 19:1-45.

- Collected SYNAPTOMYS DALLI (=BOREALIS) at several locations. At one location near Lake Lebarge they were in long grass at the edge of a small pond, while other locations were in cold boggy places near small streams. Gives description and measurements.

Osgood, W. H. 1904. A biological reconnaissance of the base of the Alaska Peninsula. N. Amer. Fauna 24. 86 pp.

- Collected 24 SYNAPTOMYS DALLI (=BOREALIS) of all age and sex categories. Found much age variation in skull measurements. Usually found in small colonies "in very wet swampy places,

preferably in wet moss." One area was a small boggy place partially filled with dead logs and branches and overgrown with moss. Says they make runways slightly smaller than MICROTUS and usually in "moss rather than grass and weeds." Gives description and measurements.

Osgood, W. H. 1904. Natural history of the Cook Inlet region, Alaska. N. Amer . Fauna 21:51-81.

- Collected 1 SYNAPTOMYS DALLI (=BOREALIS) a small peat bog near Hope. Gives description and measurements.

Osgood, W. H. 1907. Some unrecognized and misapplied names of American mammals . Proc. Biol. Soc. Wash. 20:43-52.

- Redescribes Type specimen and gives some of original description of ARVICOLA (=SYNAPTOMYS) BOREALIS from Richardson (1828).

Osgood, W. H. 1909. Biological investigations in Alaska and Yukon Territory. N . Amer. Fauna 30. 86 pp.

- For SYNAPTOMYS BOREALIS: "Rather rare, only 4 specimens taken" in E Central AK . 1 taken in a "grassy swamp" other 3 near timberline at the head of Seward Creek. In the Ogilvie Range 2 were taken in "cold Swamps." In the MacMillan region 5 were taken in a sphagnum swamp near mouth of Russell Creek.

Pearson, D. E. 1991. The northern bog lemming in Montana and the contiguous United States: Distribution, Ecology and relic species theory. Unpubl. Senior Thesis, Univ. Mont., Missoula. 33 pp.

- SYNAPTOMYS surveys were conducted with Sherman live traps at 16 sites. Describes 4 new lemming capture sites in Glacier National Park (McGee Meadows (1 animal), Little McGee Meadows (2), Numa Ridge Bog (1), and McDonald Creek (1)) and a new specimen from the known Shoofly Meadows site [see Adelman 1979]. The McDonald Creek site was part of a general small mammal project and has been surveyed on multiple occasions but only a single lemming has been captured. This site is in old-growth western hemlock (TSUGA HETEROPHYLLA) without typical bog/fen habitat (includes plant list). The other sites are all typical bog/fen habitat with thick sphagnum moss mats and are structurally described in some detail with vegetation mentioned to the generic level. Other small mammals captured at lemming sites included: CLETHRIONOMYS GAPPERI, PEROMYSCUS MANICULATUS, SOREX spp., MICROTUS spp, TAMIAS spp. Trapping success was 1 lemming per 806 Sherman live trap-nights (16 sites with 4030 TN). Mortality rate for lemmings was 60% 93 of 5). Tracking board sampling was tried, but lemming dropping could not be differentiated from MICROTUS (CLETHRIONOMYS and SOREX could be). Includes a summary of most of the specimens taken in the lower 48 states. Good discussion of research methodologies and distribution.

Peterson, R. L. 1966. The mammals of eastern Canada. Oxford University Press. Toronto, Canada. 465 pp.

- Good general reference; body measurements; references. For SYNAPTOMYS BOREALIS : rarest rodent in collections for eastern Canada. Description. Notes that 2 specimens taken in mid-January and mid-April at Indian House Lake, Quebec, showed extreme enlargement of 2 middle claws on the front feet; it is unknown if this is normal since only 2 specimens have ever been

taken during this season. A series of 6 specimens taken in northern Quebec were from a dry, partly wooded habitat. Specimens of three pregnant females in the Royal Ontario Museum taken in June had 4, 4, and 7 embryos.

Preble, E. A. 1899. Description of a new lemming mouse from the White Mountains, New Hampshire. Proc. Biol. Soc. Wash. 13:43-45.

- Description of the subspecies SYNAPTOMYS BOREALIS SPHAGNICOLA based on one specimen trapped at Fabyans (1600') near the base of Mt. Washington on 29 June 1898. Habitat "is swampy and quite densely carpeted with moss..." Associated species included MICROTUS, PEROMYSCUS, BLARINA, CLETHRIONOMYS, ZAPUS HUDSONICUS, and NAPOZAPUS INSIGNUS.

Preble, E. A. 1902. A biological investigation of the Hudson Bay Region. N. Amer. Fauna 22. 140 pp.

- For SYNAPTOMYS BULLATUS (=BOREALIS): Only trapped 2 specimens, one near Norway House. The other was a female with 6 embryos in a swamp bordering the Echimamish River on June 25.

Preble, E. A. 1902. Descriptions of new species of SYNAPTOMYS and PHENACOMYS from MacKenzie, Canada. Proc. Biol. Soc. Wash. 15:181-182.

- Description of new species SYNAPTOMYS BULLATUS (=S. BOREALIS) from Great Slave Lake, Canada from a skin and skull of adult male.

Preble, E. A. 1908. A biological investigation of the Athabaska-Mackenzie Region. N. Amer. Fauna 27. 574 pp.

- For SYNAPTOMYS BOREALIS: took 8 near site (Ft. Franklin) of those originally described by Richardson (1829) and quotes extensively from that paper. Caught one female with 4 embryos. Habitat at various sites where lemmings were captured include: 1) border of a small meadow; 2) wet swamp; 3) near small muskeg ponds; and 4) marsh. Says Loring found SYNAPTOMYS rather common in October in a sphagnum swamp and caught about a dozen. Gives measurements and descriptions and merges S. DALLI with S. BOREALIS as S.B. DALLI.

Prince, L. A. 1942. SYNAPTOMYS BOREALIS from Fort Severn, Hudson Bay, Ontario . J. Mammal. 23:216.

- An immature male SYNAPTOMYS BOREALIS was trapped at Ft. Severn on 11 July 1940 . Was taken in a "water trap" on alder and willow bordered bank of a stream draining a black spruce bog. Gives measurements of the single specimen.

Rand, A. L. 1945. Investigations on the Canal Road, Yukon and Northwest Territories, 1944.. Natl. Mus. Can. Bull. 99.

- For SYNAPTOMYS BOREALIS: 7 taken in 400 trap-nights in open, wet moss, sedge, willow and spruce swamp on Lapie River. Also taken were MICROTUS PENNSYLVANICUS. At Mount Sheldon 12 were taken in marshy sedge fringing ponds in a dwarf birch flat 11-15 Aug. On 22-25 Aug 7 were taken in a wet grassy glade on the Macmillan River. In all cases the species was

very local, with none being caught during extensive trapping in the surrounding area.

Rand, A. L. 1945. Mammals of Yukon. Natl. Mus. Can. Bull. 100. 93 pp.

- For SYNAPTOMYS BOREALIS: description and measurements. States "...scarce animal, found in grass and sedge areas in bogs and marshes where it makes runways" but no indication this is based on observations or literature or?

Reichel, J. D. 1984. Ecology of Pacific Northwest alpine mammals. Unpubl. Ph.D . Thesis, Wash. State U., Pullman. 91 pp.

- Information on distribution, dispersal, population structure and habitat use of alpine areas in WA and OR by small mammals. For SYNAPTOMYS BOREALIS one new site, and additional information on another site (Wilson et al. 1980), is given. At sites where lemmings were trapped, Gypsy Peak (918 snap trap-nights) and Slate Peak (1173 snap trap-nights) each produced a single animal (one male, one female). The Gypsy Peak site was fellfield habitat, while the Slate Peak site was a sedge/graminoid wet meadow. Lemmings were not relocated at the Cascade Creek site of Shaw (1930).

Reichel, J. D. and S. G. Beckstrom. 1993. Northern bog lemming survey: 1992. [Unpublished report] Montana Natural Heritage Program. Helena, MT. 64 pp.

- Survey of 21 sites in western Montana for SYNAPTOMYS BOREALIS using primarily snaptraps (some comparisons using live traps and pitfalls). Found 5 new sites including the southern-most sites in western North America (map). Compares baits. Lemmings were captured at elevations from 4760-6520 feet. All sites had thick mats of sphagnum moss present. Bog birch and/or a dwarf willow were present at all sites. At sites where lemmings were found, it took 5-140 trap-nights for the first lemming capture; in contrast, 240-556 trap-nights were tabulated at sites where none were captured. Other species captured at sites with bog lemmings included: MICROTUS PENNSYLVANICUS, CLETHRIONOMYS GAPPERI, SOREX, and PHENACOMYS INTERMEDIUS. Includes research needs and methods, management recommendations, and references.

Reichel, J. D. and S. G. Beckstrom. 1994. Northern bog lemming survey: 1993. Montana Natural Heritage Program. Helena, MT. 87 pp.

- During the 1993 field season small mammals were surveyed for at 30 sites, capturing northern bog lemmings at 5 new sites. One site, Wood Creek on the Rocky Mountain Ranger District, Lewis and Clark NF, is the eastern-most site known in Montana and 90 km from the nearest previously known site. Three sites on the Kootenai NF were in the Sunday Creek drainage, 1-6 km from the site discovered there in 1992. The last new site, also on the Kootenai NF, was found at Cody Lake, 32 km from the nearest known site. Despite surveys at 5 sites with apparently good-excellent habitat on the Flathead NF, no new lemming sites were found there. The total number of known bog lemming sites in Montana is 17, the most sites in any of the lower 48 states. All sites found in 1993 had moss mats at or near the trap location. Known sites in Montana range in size from 1 to 340 acres. The best habitat predictor for potential bog lemming sites in Montana is the presence of extensive, thick moss mats, particularly sphagnum moss. More sites with apparently good quality habitat were trapped unsuccessfully in 1993 than 1992; whether lemmings are actually present at some or all of those sites is unknown.

Repenning, C. A. and F. Grady. 1988. The Microtine rodents of the Cheetah room fauna, Hamilton Cave, West Virginia, and the origin of SYNAPTOMYS. U.S. Geol. Survey Bull. 1853:1-32.

- Give history of bog lemmings, starting with ancestral form from eastern Europe 4 million yrs ago. Has found evidence that SYNAPTOMYS COOPERI evolved from the MICTOMYS line (which is 3 million yrs old) only about 600,000 yrs ago.

Rhoads, S. N. 1894. Descriptions of a new subgenus and new species of arvicoline rodents from British Columbia and Washington. Proc. Acad. Nat. Sci . Philadelphia 1894:282-288.

- Description of Topotype of ARVICOLA BOREALIS (=SYNAPTOMYS BOREALIS) of an adult female taken near Ft. Anderson, north of Great Bear Lake. [NOTE: drawing of dentition looks like MICROTUS not SYNAPTOMYS BOREALIS].

Rose, R. K. and A. M. Spevak. 1978. Aggressive behavior in two sympatric microtine rodents. J. Mammal. 59:213-216.

- SYNAPTOMYS were less aggressive and showed more avoidance than MICROTUS in lab encounter trials.

Saunders, W. E. 1927. PHENACOMYS UNGAVA in Ontario. J. Mammal. 8:305-307.

- Notes on captures of PHENACOMYS UNGAVA (=INTERMEDIUS) and SYNAPTOMYS. Caught a SYNAPTOMYS almost daily.

Scott, P. A. and R. I. C. Hansell. 1989. The lemming community on the lichen- heath tundra at Churchill, Manitoba. Can. Field-Nat. 103:358-362.

- Describes lemming community by species and habitat. For SYNAPTOMYS BOREALIS only 2 were captured (2360 trap-nights), one each in a CAREX-moss-SALIX community and a SALIX community. Other species present on the sites of capture included: DICROSTONYX RICHARDSONI and MICROTUS PENNSYLVANICUS.

Seton, E. T. 1909. Life-histories of northern animals. An account of the mammals of Manitoba. Vol. 1. Charles Scribner's Sons, New York.

- Repeats other literature briefly (description, distribution, habitat of cold sphagnum bogs). No original information except "shy, secretive, nocturnal" but no citation or indication of where the information came from.

Severinghaus, W. D. 1981. Methods useful in distinguishing Microtines sympatric with the subgenus PEDOMYS. J. Tenn. Acad. Sci. 56:20-22.

Shaw, W. T. 1930. The lemming mouse in North America and its occurrence in the state of Washington. Murrelet 11:7-10.

- SYNAPTOMYS BOREALIS (immature) was first captured in Washington in "the Skagit Valley, Skagit Co. on 6 Aug 1859. At the head of Cascade Creek a single individual was taken on 30 Jul 1923 and 11 more during summer 1926; none were trapped in 1928 and 1929 at the same location.

The location was at 5000 ft at the head of the drainage in a bog-like area. The bog had many logs from avalanches, PERNASSIA FIMBRIATA, CAREX SPECTABILIS, HABENARIA SACCATA, TOFIELDIA OCCIDENTALIS, MIMULUS TILINGI, M. LEWISII, and a thick carpet of moss (HYPNUM).

Smith, H. C. 1993. Alberta mammals, an atlas and guide. Prov. Mus. Alberta, Edmonton. 238 pp.

- Good general information guide with keys, dot maps, habitat, status in Alberta , and measurements. For SYNAPTOMYS BOREALIS: identifying characteristics and description; mapped locations in N part of Alberta down W side in mountains to within 150 km of US border; status is uncommon though widely distributed; habitat is "moist meadows and bogs;" table with weight and external measurements for male (n=15) and female (n=4) lemmings.

Smith, R. W. 1940. The land mammals of Nova Scotia. Amer. Midl. Nat. 24:213- 241.

- Short accounts of new records during 1925-1940. SYNAPTOMYS COOPERI was collected but S. BOREALIS was not.

Smits, C. M. M., B. G. Slough and C. A. Yasui. 1989. Summer food habits of sympatric arctic foxes, ALOPEX LAGOPUS, and red foxes, VULPES VULPES, in the northern Yukon Territory. Can. Field-Nat. 103:363-367.

- Diets of both foxes were similar with small mammals predominating. SYNAPTOMYS BOREALIS was up to 3.7% frequency in the diet at some locales for Arctic Fox.

Soper, J. D. 1948. Mammal notes from the Grande Prairie - Peace River region, Alberta. J. Mammal. 29:49-64.

- For SYNAPTOMYS BOREALIS: "scarce and local." One male taken in moist spruce woods near shore of Lake Ray, Alberta on 6 July 1944. Measurements and pelage description.

Soper, J. D. 1973. The mammals of Waterton Lakes National Park Alberta. Can. Wildl. Serv. Rep. Series 23:1-57.

- No SYNAPTOMYS BOREALIS have been found in Park. Short summary of nearby locations and general information.

Stenseth, N. C., and R. A. Ims (eds). 1993. The biology of lemmings. Linnean Society Symposium Series 15, 683 pp.

- A series of articles by various authors on evolutionary history, taxonomy, distribution, population dynamics, food, growth, reproduction, and Intra- and Interspecific relationships. Also included are sections on the history of lemming research, future research needs, and research techniques. Little information on northern bog lemmings.

Swath, H. S. 1922. Birds and mammals of the Stikine River region of northern British Columbia and southeastern Alaska. Univ. Calif. Publ. Zool. 24:125-314.

- For SYNAPTOMYS BOREALIS: Great Glacier on Stikine River, B.C.; 3 males caught ; description; habitat- alder thicket.

True, F. W. 1894. Diagnoses of new North American mammals. Proc. U.S. Natl. Mus. 17:241-243.

- Description of Type of MICTOMYS INNUITUS (=SYNAPTOMYS BOREALIS) collected Fort Chimo, Ungava, Labrador by L.M. Turner spring 1884. Nursing female.

Weckwerth, R. P. and V. D. Hawley. 1962. Marten food habits and population fluctuations in Montana. J. Wildl. Manage. 26(1):55-74.

- A 5 year investigation of the relationships between marten population fluctuations, food habits, & prey densities in Glacier NP. Foods were mostly mammals--Cricetidae. Varied with season & availability; population trends strongly influenced by prey densities. SYNAPTOMYS BOREALIS was trapped in 2 of 5 years trapping was done. Marten scats contained SYNAPTOMYS BOREALIS at a 1.6% frequency during the study, while lemmings comprised only 2 of 223 small mammals trapped.

Wetzel, R. M. and H. L. Gunderson. 1949. The lemming vole, SYNAPTOMYS BOREALIS , in northern Minnesota. J. Mammal. 30:437.

- Gives locations for 1 immature female (5 Aug 1932) and 1 adult male (27 July 1948).

Wilson, C., R. E. Johnson, and J. D. Reichel. 1980. New records for the northern bog lemming in Washington. Murrelet 61:104-106.

- Describes 3 new sites for SYNAPTOMYS BOREALIS in Washington. One individual (immature, sex unknown) was collected 22 Jun 1979 in a wet (standing water) hummocky sedge meadow with willow and bog birch at 6100 ft. On 25 June 1980 an adult male was collected at a similar site (less hummocky, no bog birch) at 5400 ft, about 6 mi from the first site. At both these sites MICROTUS PENNSYLVANICUS was also trapped. An immature female was captured at the third site (extreme NE WA) at 7250 ft on 23 Aug 1980. The habitat was a barren alpine ridge (15% vegetative cover) at least 900 vertical ft above the nearest boggy meadow.

Wright, P. L. 1950. SYNAPTOMYS BOREALIS from Glacier National Park, Montana. J . Mammal. 31(4):460.

- First record of northern bog lemming in Montana. Adult male caught. HABITAT: a swampy area; plants included Englemann spruce, timothy, false hellebore, alder, nannyberry, cow parsnip, horsemint, yellow monkey flower, and snowberry . ASSOCIATED SPECIES included: MICROTUS PENNSYLVANICUS and SOREX VAGRANS. TRAPPING SUCCESS: 1 lemming in 62 trap-nights; not found at same site during 200 trap-nights 2 months later.

Wrigley, R. E. 1974. Ecological notes of animals of the Churchill region of Hudson Bay. Arctic 27:201-214.

- One SYNAPTOMYS BOREALIS collected in sedge-moss tundra 35 mi. NW of Churchill.

Youngman, P. M. 1964. Range extensions of some mammals from northwestern Canada. Natl. Mus. Can., Nat. Hist. Paper 23. 6 pp.

- For SYNAPTOMYS BOREALIS: lists far north records including Old Crow and Rampart House, Yukon, the farthest know north records for the species at the time.

Youngman, P. M. 1968. Notes on mammals of southeastern Yukon Territory and adjacent Mackenzie District. Natl. Mus. Can. Bull. 223:70-86.

- For SYNAPTOMYS BOREALIS: collected in the N. W. T.: 1) a male and nonparous female in a hot spring meadow with MICROTUS PENNSYLVANICUS and M. LONGICAUDUS at 4000 ft, Flat River; 2) one at a marsh at Glacier Lake, 2500 ft; in the Yukon: 3) a male in riparian brushlands 5 mi E of Little Hyland River, 6000 ft and a male at 4000 ft; 4) 11 males and 4 females in white spruce at North Toobally Lake, 2200 ft.

Youngman, P. M. 1975. Mammals of the Yukon Territory. Natl. Mus. Canada, Publ . Zool. 10. 192 pp.

- Very good general reference with sections on environmental influences, vegetation and refugium effects on mammal distribution. Species accounts have detailed taxonomic synonymies, dot maps, external and skull measurements, and remarks on fossils, habitat, and ecology. For SYNAPTOMYS BOREALIS: distributed throughout the wooded portion of the Yukon. Has external and skull measurements of males (n=18) and females (n=5-6); pelage description. Suggests that S. BOREALIS speciated in a south-western refugium and is a post- glacial immigrant to the north. Collected in the Yukon "between 800 and 6000 ft mostly in bogs and marshes." Stated 10 pregnant females averaged 4.4 (3-6) embryos.

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Please send comments to: mtnhp@state.mt.us

Montana Natural Heritage Program
1515 East Sixth Avenue
Helena, MT 59620

(406) 444-3009
Fax: (406) 444-0581

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